Optimized memory polynomial with binomial reduction in digital pre-distortion for wireless communication systems

ABSTRACT

The non-linearity of the Power Amplifier (PA) causes signal amplitude and phase distortion which contributes to Adjacent Channel Interference (ACI). Moreover, today's inevitable increasing bandwidth and transmission speed causes Memory Effects, an undesired scattering of the PA output signal. Among various PA linearization methods, Digital Predistortion (DPD) stands out due to its balanced advantages and trade-offs in implementation simplicity, bandwidth, efficiency, flexibility and cost. An accurate modeling of the PA is required by the DPD, where the highly popular Memory Polynomial Method (MP) is used to model the PA with Memory Effects but with reduced complexity. This project presents the Memory Polynomial with Binomial Reduction method (MPB) which is a performance optimized MP with reduced addition and multiplication operations. When compared to MP, MPB is capable of achieving improvements in Normalized Mean Square Error (NMSE) of up to 35dB. The MPB and MP methods are simulated/compared using a modeled ZVE-8G Power Amplifier and sampled 4G (LTE) signals.

Keyword: Power amplifier; PA linearization; Digital pre-distortion; 4G; Memory polynomial